We Claim:

1. A method for manufacturing a battery having plates and an AGM separator, comprising:

mixing (i) silica and (ii) an electrolyte containing sulfuric acid to form a first silica-electrolyte mixture, wherein silica as SiO_2 is in a range of about 1.0 percent to about 8.0 percent by weight of said first silica-electrolyte mixture, and further wherein a particle size of said silica is less than 100 nanometers;

contacting said first silica-electrolyte mixture with said plates and said AGM separator; and

forming said plates by applying current thereto, wherein during and after said plates are formed, said first silica-electrolyte mixture gels to form a first gelled electrolyte.

2. The method of claim 1 wherein silica as SiO_2 is in a range of about 2.5 percent to about 3.5 percent by weight of said first silica-electrolyte mixture.

3. The method of claim 1 wherein a concentration of said sulfuric acid is selected so that a specific gravity of said first gelled electrolyte is at a desired value, after plate formation, as a function of a voltage of said battery.

4. The method of claim 1 further comprising:

mixing (i) silica and (ii) an electrolyte containing sulfuric acid to form a second silica-electrolyte mixture, wherein silica as SiO_2 is in a range of about 10 percent to about 19 percent by weight of said second silica-electrolyte mixture, and wherein said second silica-electrolyte mixture rapidly gels to form a second gelled electrolyte; and further wherein a concentration of said sulfuric acid is selected so that a specific gravity of said second gelled electrolyte is at said desired value; and

adding said second silica-electrolyte mixture to said battery after said plates are formed and in an amount sufficient to substantially fill any void volume remaining in said battery.

5. The method of claim 4 wherein a ratio of a volume of said first gelled electrolyte to a volume of said second gelled electrolyte is in a range of about 24:1 to 32:1.

6. A method for manufacturing a battery, comprising:

contacting an AGM separator and plates of said battery with a first silica-electrolyte mixture, wherein said first silica-electrolyte mixture comprises (i) colloidal silica and (ii) an electrolyte containing sulfuric acid, and wherein silica as SiO_2 is in a range of 1.0 percent to 8.0 percent by weight of said first silica-electrolyte mixture;

forming said plates by passing current therethrough; and

adding a second silica-electrolyte mixture to said battery after forming said plates, wherein said second silica-electrolyte mixture comprises (i) colloidal silica and (ii) an electrolyte containing sulfuric acid, and wherein silica as SiO_2 is in a range of about 10 percent to about 19 percent by weight of said second silica-electrolyte mixture.

7. The method of claim 6 wherein said first silica-electrolyte mixture gels to form a first gelled electrolyte during said forming of said plates, and wherein a specific gravity of said first gelled electrolyte is in a range of about 1.28 to 1.31, as a function of a desired voltage of said battery.

8. The method of claim 6 wherein a specific gravity of said second silica-electrolyte mixture is in a range of about 1.28 to 1.31.

9. The method of claim 6 wherein a ratio of a volume of said first silica-electrolyte mixture to a volume of said second silica-electrolyte mixture is in a range of about 24:1 to 32:1.

10. The method of claim 6 wherein forming said plates further comprises conducting plate formation at sub-atmospheric pressure.

11. The method of claim 1 wherein a particle size of said silica is in a range of about 10 to 20 nanometers.

12. The method of claim 1 wherein said silica as SiO_2 is in a range of about 2.5 percent to about 3.5 percent by weight of said first silica-electrolyte mixture.

13. A valve-regulated, lead-acid battery comprising:

a plurality of lead-acid cells, each cell comprising:

a plurality of spaced-apart positive plates, wherein said positive plates have a plurality of pores, and wherein at least some of said pores have a first gelled electrolyte adsorbed therein;

a plurality of spaced-apart negative plates arranged in alternating order with said positive plates, wherein said negative plates have a plurality of pores, and wherein at least some of said pores have said first gelled electrolyte adsorbed therein;

absorbent glass mat separator disposed between adjacent positive and negative plates, wherein said absorbent glass mat separator comprises a mesh and is at least about 90 percent porous, and wherein said mesh is substantially full of said first gelled electrolyte; and

a battery container, wherein said plurality of lead-acid cells are disposed in said battery container.

14. The battery of claim 13 wherein said first gelled electrolyte contains silica as SiO_2 and has a specific gravity that is within a range of about 1.28 to about 1.31.

15. The battery of claim 13 further comprising a gap between:

said positive plates and a wall of said battery;

said negative plates and said wall of said battery; and

said absorbent glass mat separator and said wall of said battery, wherein a second gelled electrolyte is disposed in said gap, wherein said second gelled electrolyte comprises silica as SiO_2, has a higher silica content than said first gelled electrolyte, and has a specific gravity that is within a range of about 1.28 to about 1.31.

16. The battery of claim 13 further comprising a space above said positive plates, said negative plates, and said absorbent glass mat separator, wherein a second gelled electrolyte is disposed in said space, wherein said second gelled electrolyte comprises silica as SiO_2, has a higher silica content than said first gelled electrolyte, and has a specific gravity that is within a range of about 1.28 to about 1.31.

17. A valve-regulated lead-acid battery comprising:
a plurality of lead-acid cells, each cell comprising:

a plurality of spaced-apart positive plates, wherein said positive plates comprise PbO_2 that is generated during a formation reaction that is conducted in the presence of a first silica-electrolyte mixture comprising silica and an electrolyte that contains sulfuric acid, wherein said silica as SiO_2 is in a range of about 1 percent to about 8 percent by weight of said first silica-electrolyte mixture;

a plurality of spaced-apart negative plates arranged in alternating order with said positive plates, wherein said negative plates comprise Pb that is generated during a formation reaction that is conducted in the presence of said first silica-electrolyte mixture;

absorbent glass mat separator disposed between adjacent positive and negative plates, said absorbent glass mat separator comprising a mesh; and

first gelled electrolyte that is formed from said first silica-electrolyte, wherein said first gelled electrolyte resides in pores of said positive plates, pores of said negative plates, the space between said positive and negative plates and in said mesh of said absorbent glass mat separator.

18. The battery of claim 17 further comprising:

a battery container having a plurality of physically-isolated compartments, wherein one lead-acid cell of said plurality thereof is disposed in each said compartment, and wherein said lead-acid cells are electrically connected to one another; and

a second gelled electrolyte, wherein said second gelled electrolyte is formed from a second silica-electrolyte mixture containing silica as SiO_2 in a range of about 10 percent to about 19 percent by weight of said second silica-electrolyte mixture, wherein said more of said first gelled electrolyte is present in said battery than said second gelled electrolyte.

19. The battery of claim 17 wherein silica as SiO_2 is in a range of 2.5 percent to 3.5 percent by weight of said first-electrolyte mixture, and wherein said first-electrolyte mixture comprises sulfuric acid, and further wherein a concentration of said sulfuric acid in said first-electrolyte mixture is selected so that a specific gravity of said first gelled electrolyte is at a desired value as a function of a voltage of said battery.

20. The battery of claim 18 wherein a ratio of a volume of said first gelled electrolyte to a volume of said second gelled electrolyte is in a range of about 24:1 to 32:1.